What is claimed is:

1. A boiling cooler for cooling a heating element, the boiling cooler comprising:

a heat exchange part in which refrigerant vapor performs heat exchange with coolant, the refrigerant vapor being produced from liquid refrigerant that is boiled and gasified by heat transferred from a heating element.

2. The boiling cooler according to claim 1, wherein the heat exchange part defines therein a vapor passage in which the refrigerant vapor flows, and a coolant passage in which the coolant flows to perform the heat exchange with the refrigerant vapor, the coolant passage adjoining the vapor passage.

3. The boiling cooler according to claim 2, further comprising a tank defining a refrigerant chamber for storing the liquid refrigerant therein with a liquid surface, wherein:

the vapor passage is provided above the liquid surface inside the tank.

4. The boiling cooler according to claim 3, wherein the tank is separated from the coolant passage by a boundary wall that has a convexo-concave shape.

5. The boiling cooler according to claim 4, wherein

the boundary wall has a plurality of protruding portions protruding into the coolant passage and having heights that have a maximum value generally at a central portion of the tank in a horizontal direction and decrease toward both sides of the tank in the horizontal direction.

6. The boiling cooler according to claim 4, wherein:

the boundary wall has first and second protruding portions protruding into the coolant passage; and

an inner fin is disposed in the coolant passage between outer walls of the first and second protruding portions to increase a radiation area for radiating heat.

7. The boiling cooler according to claim 2, further comprising a coolant circuit composed of a radiator and a pump for circulating the coolant therein, wherein:

the coolant passage is connected to the coolant circuit; and

the coolant is circulated in the coolant passage by an operation of the pump.

8. The boiling cooler according to claim 1, further comprising:

a refrigerant vessel storing the liquid refrigerant therein for boiling the liquid refrigerant by the heat from the heating element to produce the refrigerant vapor, the refrigerant vessel defining therein a vapor outflow passage

having first and second outlet portions at both sides in a flow direction approximately parallel to a horizontal direction, the vapor outflow passage having an upper wall that is inclined so that the refrigerant vapor flows toward at least one of the first and second outlet portions upward along the upper wall; and

first and second radiators respectively communicating with the first and second outlet portions of the vapor outflow passage, and respectively having the heat exchange part.

9. The boiling cooler according to claim 8, wherein the first radiator has a looped shape and surrounds an entire circumference of the refrigerant vessel where the vapor outflow passage is open to form the first outlet portion through which the first radiator and the vapor outflow passage communicate with each other.

10. The boiling cooler according to claim 8, wherein:

the first radiator has a lower tank communicating with the vapor outflow passage and the heat exchange part disposed above the lower tank;

in the heat exchange part, the refrigerant vapor is liquefied as condensate by the heat exchange with the coolant;

the refrigerant vessel has a liquid return passage into which the condensate flows from the heat exchange part,

the liquid return passage communicating with the vapor outflow passage through the lower tank of the first radiator.

11. The boiling cooler according to claim 1, wherein the boiling cooler is used for a vehicle.

12. The boiling cooler according to claim 1, further comprising:

a refrigerant vessel storing the liquid refrigerant for transferring the heat from the heating element to the liquid refrigerant to boil the liquid refrigerant, the refrigerant vessel having a boiling portion where the liquid refrigerant boils to produce the refrigerant vapor, and defining therein a vapor outflow passage in which the refrigerant vapor flows toward first and second outlet portions provided both ends of the vapor outflow passage; and

first and second radiators respectively communicating with the first and second outlet portions of the vapor outlet passage, and respectively having the heat exchange part in which the refrigerant vapor is cooled by the heat exchange with the coolant.

13. The boiling cooler according to claim 12, wherein:

the first radiator has a lower tank communicating with the vapor outflow passage through the first outlet portion,

and the heat exchange part disposed above the lower tank;

in the heat exchange part, the refrigerant vapor is liquefied as condensate by the heat exchange with the coolant;

the refrigerant vessel has a liquid return passage into which the condensate flows from the heat exchange part, the liquid return passage communicating with the vapor outflow passage through the lower tank of the first radiator.

14. The boiling cooler according to claim 1, further comprising:

a refrigerant vessel storing the liquid refrigerant for transferring the heat from the heating element to the liquid refrigerant;

a radiator communicating with the refrigerant vessel and having the heat exchange part for cooling the refrigerant vapor by the heat exchange with the coolant to produce condensate, the refrigerant vapor being produced in the refrigerant vessel by the liquid refrigerant boiled by the heat; and

a refrigerant flow control member disposed between the heat exchange part of the radiator and the refrigerant vessel, and having a control plate that is disposed approximately horizontally to divide a radiator side space from a refrigerant vessel side space and has a plurality of communication ports through which the radiator side space communicates with the refrigerant vessel side space, the

refrigerant flow control member being for controlling a flow of the refrigerant vapor from the refrigerant vessel side space to the radiator side space, and a flow of the condensate from the radiator side space to the refrigerant vessel side space.

15. The boiling cooler according to claim 14, wherein:

the plurality of communication ports are composed of a plurality of first communication ports and a plurality of second communication ports;

the plurality of first communication ports cylindrically protrude from an upper surface of the control plate into the radiator side space and are open at a position higher than the upper surface of the control plate in a vertical direction; and

the plurality of second communication ports cylindrically protrude from a lower surface of the control plate into the refrigerant vessel side space and are open at a position lower than the lower surface of the control plate in the vertical direction.

16. The boiling cooler according to claim 15, wherein each of the plurality of first communication ports has an opening area larger than an opening area of each of the plurality of second communication ports.

17. The boiling cooler according to claim 14, wherein:

the plurality of communication ports are composed of a plurality of first communication ports and a plurality of second communication ports;

the plurality of first communication ports are open on an upper surface of the control plate without protruding from the upper surface; and

the plurality of second communication ports cylindrically protrude from a lower surface of the control plate into the refrigerant vessel side space and are open at a position lower than the lower surface of the control plate in a vertical direction.

18. The boiling cooler according to claim 17, wherein each of the plurality of first communication ports has an opening area larger than an opening area of each of the plurality of second communication ports.

19. The boiling cooler according to claim 14, wherein:

the plurality of communication ports are composed of a plurality of first communication ports and a plurality of second communication ports;

the plurality of first communication ports cylindrically protrude from an upper surface of the control plate into the radiator side space and are open at a position higher than the upper surface of the control plate

in a vertical direction; and

the plurality of second communication ports are open on a lower surface of the control plate without protruding from the lower surface.

20. The boiling cooler according to claim 19, wherein each of the plurality of first communication ports has an opening area larger than an opening area of each of the plurality of second communication ports.

21. The boiling cooler according to claim 14, wherein the plurality of communication ports are arranged on the control plate at an approximately constant pitch.

22. A cooling system for cooling a heating element, comprising:

a boiling cooler having a heat exchange part in which refrigerant vapor performs heat exchange with coolant, the refrigerant vapor being produced from liquid refrigerant that is boiled and gasified by heat transferred from a heating element;

a radiator connected to the boiling cooler, for cooling the coolant; and

a motor connected to the boiling cooler in series for supplying the coolant from the radiator to the boiling cooler.

23. The cooling system according to claim 22, wherein the boiling cooler, the radiator, and the motor constitute a coolant circuit in which the coolant circulates.

24. The cooling system according to claim 22, wherein the radiator cools the coolant by heat exchange with air flowing outside the radiator.

25. The cooling system according to claim 22, further comprising a pipe connecting the radiator and a coolant passage defined in the boiling cooler in which the coolant flows.